

REMARKS

This Amendment, submitted in response to the Office Action dated April 7, 2004, is believed to be fully responsive to each point of rejection raised therein. Accordingly, favorable reconsideration on the merits is respectfully requested.

As a preliminary matter, the Examiner has objected to the specification for containing informalities. Applicants have amended the specification, as set out above.

Turning to the merits of the Office Action, Claims 1-11 remain pending in the application and have been rejected under 35 U.S.C. § 102 as being anticipated by Hibbard (U.S.P. 5,382,976). Claims 1-11 have further been rejected under 35 U.S.C. § 102 as being anticipated by Kawabe (U.S.P. 6,654,510). Applicant submits the following comments in traversal of the prior art rejections.

Applicant's invention relates to an image signal processor. Conventionally known processors provide noise reduction based on low pass filtering, for example. However, the effects of filtering are known to differ depending on the mode of image signal capture and processing. It is not practical to include several sets of filters to satisfy the noise reduction for multiple modes in a capturing device.

Applicant's invention overcomes the above deficiencies. Referring to Fig. 2, the exemplary image signal processing device includes a threshold calculating circuit 340 which determines an image-wide threshold condition, which becomes fine-tuned by a threshold correcting circuit 342 on a pixel by pixel basis. Further referring to Fig. 4, the exemplary device includes average circuit 3460, adder 3462, comparing circuit 3466, OR gate 3468, and switch

3464. The comparing circuit 3466 receives an output 50 of the threshold correcting circuit, for comparison with a difference signal between an image signal 46 and an average of images signals 51 based on upon the pixel of a subject pixel and surrounding pixels. Depending on the relative differences, a value is supplied to the OR gate, which also receives an inhibit signal 52 depending on an edge detection. The outputs of the OR gate select which signal (image signal 46 or average 51) is supplied as the noise reduction result 50.

Turning to the cited art, Hibbard relates to a method of determining interpolation for different color signals based on the result of a single color sparse data set and surrounding gradient data. In interpolating green data for pixel locations (red and blue) where green data is missing, the image gradients in horizontal and vertical directions are compared to a threshold. Depending on the result of the horizontal or vertical gradient, either an average of 4 or 2 pixels are taken as an average for an adaptive value which serves as the interpolated result. Cols. 5-6.

Kawabe relates to a type of image signal processing. Referring to Fig. 8, the blackened circle represents a target pixel, with adjacent pixels indicated by 1-4. The absolute difference between the target pixel and data marked 1 are compared with a threshold. If the threshold values are greater, the pixels marked by 1 are used for smoothing, otherwise, the image data marked with the blackened circle is used for smoothing. Next, with the image data marked by 1 used for smoothing, the difference between image data marked by 2 is compared to the data of the blackened circle. When the threshold values are greater, the pixels marked by 2 become used for smoothing, otherwise, an average value of the data marked by the blackened circle and data marked by 1 are used.

The Examiner contends that each of Hibbard and Kawabe teaches features of Applicant's independent claim 1. However, Applicant would argue that neither reference teaches the features of the noise reducing circuit.

The noise reducing circuit of claim 1 describes production of a difference in level between a subject pixel data and mean value of the subject pixel data and pixel data around the subject pixel, and selecting either the subject pixel or the mean depending on a threshold value (determined in accordance with input conditions) and the difference.

The Examiner relies on the interpolator circuit 44 of Hibbard for teaching this feature and further relies on the disclosure at col. 5, lines 30-56. However, in interpolation operations of Hibbard, the mean value for the subject pixel is not determined for the sake of determination of a difference. Any differences, such as a gradient, are expressed in comparison with a threshold, but not the subject pixel value and not a mean value as claimed. Moreover, the average value of either four pixels or two horizontally arranged or vertically arranged pixels are always taken as the interpolator value. Therefore, there is never a selection of the pixel or a mean value depending on a threshold value and the difference. Applicant submits that the Examiner has merely examined the Hibbard reference for generalized concepts such as pixel differences and averages but has not adequately considered the relations as described in independent claim 1. While claim 1 includes a mean value determination prior to a selection between the subject pixel data and a mean, Hibbard does not calculate an average, except as an end result for interpolation. Therefore, Hibbard does not anticipate claim 1 for at least these reasons.

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Similarly, the Examiner's rejection over Kawabe is similarly deficient. The Examiner cites the processing at cols. 23-24 to teach the claimed features for noise reduction. However, the difference is Kawabe relates to a difference between a target (blackened) pixel and a surrounding pixel 1. There is no calculation of a mean of the subject pixel in determining the difference between the subject pixel and the mean of the subject pixel and pixel data around the subject pixel. Kawabe shares the same deficiency as Hibbard. Therefore, Kawabe does not anticipate claim 1 for at least these reasons.

Because claim 7 includes the similar characteristics of a mean value determination of a subject pixel and data around the subject pixel and a difference between the mean and the subject pixel, claim 7 is patentable over Hibbard and Kawabe for the reasons set forth above for claim 1.

In view of the above, Applicant submits that claims 1-25 are in condition for allowance. Therefore it is respectfully requested that the subject application be passed to issue at the earliest possible time. The Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary.

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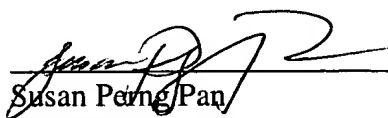
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Date: August 9, 2004